RESEARCH ARTICLE

GENERAL AND SPECIFIC COMBINATION CAPACITY OF SOME PROMISING AND REGIONAL RICE VARIETIES OF RIZ PROMETTEUSES AND REGIONALS

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ARTICLE INFO	ABSTRACT
	The present work aims to study the general and specific combining capacity of the varieties involved in the crossing according to the complete diallel scheme. The trial undertaken in randomized block with four (4) replications, on mineral nutrition (N24 P 12K 12 low background, N48P24K24 high background) was carried out in the experimental station of the National Institute of Agronomic Research of Brazzaville (IRA) in the Republic of Congo. The following characteristics were taken into account: The mass of the main panicle, the number of spikelets completed on the main panicle, the growth rate of the embryonic stem (coleoptile), the growth rate of the embryonic root, the length of the main panicle and the mass of the main panicle. On the basis of the mass of grains per plant in all the varieties studied, the varieties Liman, VNIIR 7679 have a high general combining capacity. The specific combining capacity is maximum at this point for the following combinations: Liman/ Khazar, VNIIR 7679/ Khazar, Droujny/ Leader. The study carried out made it possible to identify varieties with a high overall combining capacity for a certain number of characteristics.

INTRODUCTION

The main ability of high genetic combination, as well as heterosis, are non- allelic genes that control viability, combined into a well- coordinated set (Strunnikov V.A., 1987). An increase in the number of genes of high viability, the effect is not in arithmetic, but in geometric progression. The appearance of varieties with a set of such genes during sexual reproduction is an extremely rare phenomenon, therefore the study of parental forms with high ability is a process almost laborious, but necessary for traditional and heterotic breeding (Gorbunova V.Y., 1976). To facilitate this, it is necessary to create a database on the general and specific combining capacity of promising and disseminated varieties, according to various characteristics (Dradavtsev et al, 1974). In the Republic of Congo, rice is generally grown in the valley of the Kindamba and Ewo rivers. The government is carrying out work to expand the cultivated land and increase the harvest through the introduction of new cultivation technologies and the use of better varieties. But despite these measures, rice yield remains low. The issues of variety selection and agricultural techniques are poorly studied (Makoundou, 2005). The study and introduction of new varieties in Africa (ITTA.IRAT), in the Philippines (IRRI), in the USA (IRA), these are ecologically soft varieties, with a yield, with seeds of high technological and food value, that is to say possessing valuable characteristics. The value of quantitative characteristics in different environmental conditions favors the introduction of these varieties that adapt to the conditions of their cultivation (Tour N.S, 1987,1991).

MATERIALS AND METHODS

Plant material: The plant material consists of rice seeds (Oryza sativa). These seeds come from Asia. The following varieties were used as a basis for the study: Liman, Khazar, Druzhny, Narcissus, Fontan, VNIIR 7887, VNIIR7718, VNIIR 7653, VNIIR7679, Leader

Experimental site: To conduct this study, the experimental site was randomly selected within the IRA compound. The experimental site was located more precisely behind the livestock feed storage building. The study of this work was carried out from November 13, 2022 to November 20, 2023. The experimental site of this study was selected in the department of Brazzaville, more precisely within the compound of the National Institute of Agronomic Research.
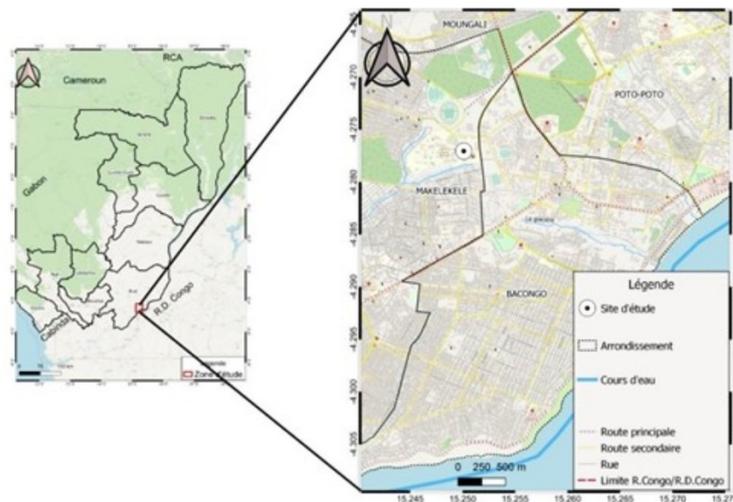
Figure 1. Map of the study area

Table 1. General and specific combining ability of rice varieties based on main panicle mass (high ground)

Varieties	Specific combination ability						General combination capacity
	Liman	Leader	Khazar	Droujny	VNIIR 7679	VNIIR 7679	
Liman		-1,48	2,64	-0,99	0,47	6,05	1,16
Leader	-7,78		0,15	-0,22	-0,93	0,62	-0,34
Khazar	-1,96	-0,15		-0,49	-1,11	1,57	-0,46
Droujny	0,48	0,99	1,11		0,33	0,21	-0,10
VNIIR 7679	-7,03	-0,33	-0,69	-1,17		1,90	-0,59
VNIIR 7679	-2,35	2,03	2,61	-1,09	1,90		0,33

Table 2. General and specific combining ability of rice varieties based on main panicle mass (low base)

Varieties	Specific combination ability						General combination capacity
	Narcisse	Fontan	Liman	VNIIR7887	VNIIR 7718	Khazar	
Narcisse		-0,24	0,98	-0,05	-0,06	0,12	0,06
Fontan	-0,51		0,06	0,07	-0,13	-0,06	-0,07
Khazar	-0,06	0,06		-0,04	-0,18	-0,07	0,15
Droujny	0,05	-0,13	-0,04		0,06	0,14	-0,06
VNIIR 7679	0,14	-0,13	-0,14	-0,24		0,04	-0,06
VNIIR 7679	0,12	-0,36	0,13	-0,26	-0,06		-0,03

Table 3. General and specific combining ability of rice varieties based on main panicle mass (high ground)

Varieties	Specific combination ability						General combination capacity
	Narcisse	Fontan	Liman	VNIIR7887	VNIIR 7718	Khazar	
Narcisse		0,66	0,38	-0,12	-0,07	0,59	-0,43
Fontan	0,16		0,06	0,16	0,11	-0,13	0,00
Liman	0,38	-0,04		-0,12	0,13	-0,11	0,17
VNIIR7887	0,78	0,26	-0,32		0,23	0,29	-0,13
VNIIR 7718	0,13	-0,19	-0,17	0,23		0,24	0,12
Kharar	0,19	-0,13	-0,21	-0,01	-0,06		0,26

Table 4. General and specific combining ability of rice varieties based on main panicle length (high ground)

Varieties	Specific combination ability						General combination capacity
	Narcisse	Fontan	Liman	VNIIR7887	VNIIR 7718	Khazar	
Narcisse		1,58	0,52	-0,11	-0,03	1,02	1,39
Fontan	0,38		1,29	0,27	1,64	0,89	1,02
Liman	-0,88	0,99		1,11	0,68	-0,57	-1,02
VNIIR7887	-0,11	0,87	0,91		1,56	2,21	-1,00
VNIIR 7718	0,47	1,14	2,08	0,56		1,68	-0,87
Khazar	-1,38	0,59	0,43	1,01	-0,32		0,48

Table 5. General and specific combining ability of rice varieties based on lateral panicle mass (high ground)

Varieties	Specific combination ability						General combination capacity
	Narcisse	Fontan	Liman	VNIIR7887	VNIIR 7718	Khazar	
Narcisse		0,39	0,01	-0,53	0,15	0,61	-0,28
Fontan	0,09		0,81	-0,03	-0,15	-0,09	-0,18
Liman	0,81	0,41		-0,70	-0,23	0,04	-0,01
VNIIR7887	-0,53	-0,73	-0,30		1,64	-0,40	0,43
VNIIR 7718	0,45	0,75	0,07	0,34		-0,43	0,15
Khazar	0,01	0,71	0,24	-0,80	-0,03		-0,11

This site is located in the South- East of Brazzaville 4°16′38.0″S 15°15'09.4"E in the district 1 Makélékélé, on the avenue of the first African games and covers an area of approximately 5 hectares. Their altitudes vary between 279 and 323 m. It is limited to the South by the Ministry of Scientific Research and Technological Innovation, to the North by the Institute of Young Deaf People, to the West by the Tennis Club, to the East by the INJS.

Methods

We studied the general combining ability and the specific combining ability of the varieties involved in the crossing according to the full diallel scheme. The following characteristics were taken into account: the mass of the main panicle, the number of terminated spikelets on the main panicle, the growth rate of the embryonic stem (coleoptile), the growth rate of the embryonic root. The following varieties served as a basis for the study: Liman, Khazar, Droujny, Narcisse, Fontan, VNII7887, VNII7718, VNIIR 7653, VNIIR7679, Leader.

RESULTS

The results in Table 1 show on the basis of grain mass per plant. in all studied varieties. The varieties Liman, VNII 7679 have a high general combining ability. In Table 1, the specific combining ability is maximum at this point for the combinations: Liman/ Khazar, VNIIR 7679/ Khazar, Druzhny/ Leader. Table 2, according to the characteristics relative to the number of spikelets on the main panicle, the varieties Khazar, VNII7887 have a high combining ability. The specific combining ability is high on the basis of the mass of the panicle (weak background) found in all the studied varieties: Liman, Narcissus and Khazar. On the other hand, we note that the specific combining ability is maximum on this basis for the following combinations: Narcissus/ Liman, Khazar/ Fontan, VNIIR7887/ Khazar, VNIIR7718/ Narcissus. The results obtained on the same set of varieties differ significantly when growing plants on a high background of mineral nutrition (N24P12K12 low background, N48 P24K24 high background). The results of Table 3 show that the high general combining ability based on the mass of the main panicle (high background) is found in all the studied varieties: Khazar, VNIIR 7718, Liman, Fontan - these are varieties that respond to the application of high doses of fertilizers. So the specific combining ability is high in accordance with Table 3 for the combinations VNIIR 7887/ Narcissus, Narcissus/ Khazar, Liman/ Narcissus. Therefore, when assessing the combining ability according to various characteristics, it is necessary to take into account the context of mineral nutrition and the conditions of the study environment. Table 4 shows us that the varieties Narcisus, Fontan, Khazar have a high general combining capacity based on the length of the main panicle (high base).

That is why the specific combining capacity is high for the following combinations: VNIIR 7887/ Khazar, VNIIR 7718/ Liman, VNIIR 7718/ Khazar. Now in Table 5 the varieties VNIIR 7887, VNIIR 7718 and Liman have a high general combining capacity considering the mass of lateral panicles. So the specific combining capacity is high in Table 5 for the following combinations: VNIIR 7887/ VNIIR7718, Fontan/ Liman, Liman/ Narcissus, Narcissus/ Khazar, VNIIR7718/ Fontan.

CONCLUSION

The conducted study allowed to identify varieties with a high overall combining ability for a number of characteristics. Liman and Khazar varieties have a high combining ability for most of their characteristics affecting productivity, both on a high and low background of mineral nutrition. They can be used as parental forms when creating varieties for energy-intensive and huge technologies. Varieties VNIIR7718, VNIIR7887, VNIIR 7679 are characterized by a high specific combining ability when grown in a background of high mineral nutrition. Therefore, it is more expedient to use these varieties for create intensive varieties.

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